INTERESTED?

The *Home Builders Guide to Ducts in Conditioned Space* provides valuable information on how to design and build homes to save energy and reduce utility bills. Separate publications address the interests of energy code officials, building code officials and homeowners.

Who will benefit from this research?

- Residential builders, subcontractors, developers, and architects
- Energy and building code developers and officials
- Homeowners

Key next steps include:

- *Home Builders:* Adopt the approaches recommended in the *Builder's Guide.* Check with utility companies for efficiency program information.
- *Homeowners:* Support builders who build energy-efficient homes with ducts in conditioned space.
- *Building code officials:* Review your code's attic-venting requirements in light of the solutions recommended by this project.
- *Policymakers:* Promote the use of ducts in conditioned space.
- *Researchers:* Pursue side-by-side tests of houses with and without ducts in conditioned space.

This project was part of the *Integrated Energy Systems: Productivity and Building Science* program. To learn more, visit www.newbuildings.org/pier.

pier
PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

Funded by the
California Energy Commission
Public Interest Energy Research Program

Contact information:

California Energy Commission
www.energy.ca.gov/pier
Don Aumann
daumann@energy.state.ca.us

New Buildings Institute
www.newbuildings.org
Cathy Higgins
higgins@newbuildings.org

GARD Analytics
www.gard.com
Roger Hedrick
rhedrick@gard.com

Reports and Guidelines are available at
www.newbuildings.org/pier or
www.energy.ca.gov/pier
or call 916-654-5200

NEW BUILDINGS INSTITUTE

GARD Analytics
Energy, Economic and Environmental Research

Rev October 2003

BUILDING HOMES WITH DUCTS IN CONDITIONED SPACE

DUCTS IN HOMES: LOCATION, LOCATION, LOCATION

pier
PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

The Problem with Unconditioned Space

New homes in California are typically built with the air handler and ductwork located in an unconditioned attic. The resulting air leaks, reduced airflow, and increased infiltration can lead to significant energy losses and comfort problems.

Leaks on the supply side of the system result in air loss to the unconditioned attic and to the outdoors, while leaks on the return side result in unconditioned air being brought into the system, increasing the space conditioning load. In addition, attic temperature is well above the outdoor air temperature in summer, causing more energy to deliver cool air to the home.

Locating ducts inside the conditioned space can reduce energy use

This project identifies energy-efficient options for building homes with ducts located in conditioned space while also:

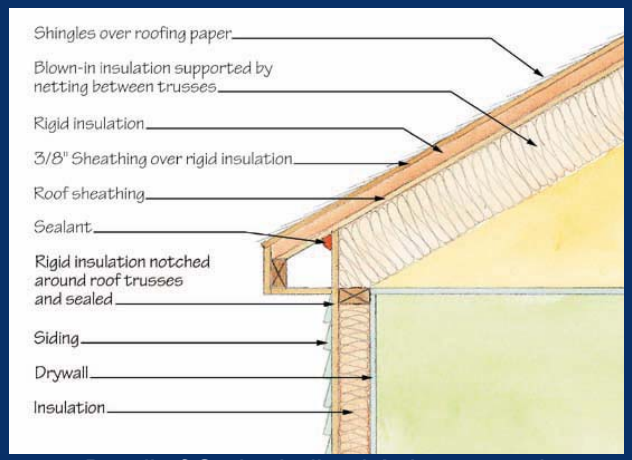
- maximizing marketable floor area
- minimizing energy cost
- minimizing construction costs
- simplifying the construction process

Building Homes with Ducts in Conditioned Space

The Homebuilder's Guide to Ducts in Conditioned Space *(Builder's Guide)* describes techniques for constructing new homes with ducts in conditioned space.

The Builder's Guide presents three design approaches: dropped ceiling, cathedralized attic, and plenum truss. It provides sufficient detail so that a builder can modify current house designs to incorporate ducts in conditioned space, including:

- strategies for overcoming market barriers
- cost estimates
- energy, demand, and energy-cost benefits
- construction drawings and descriptions of each approach

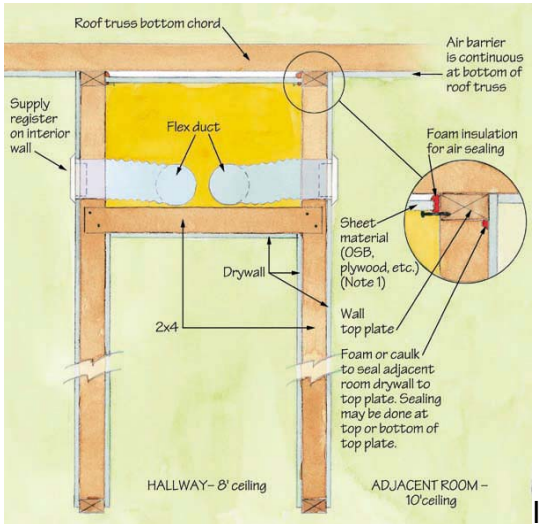


Detail of Cathedralized Attic approach

Benefits of Ducts in Conditioned space

This study's findings confirm that building houses with ducts in conditioned space is technically feasible, and can be done at fairly small cost increments with valuable returns in energy savings.

- Cost impact to builder: 0% to 3% of construction costs
- Estimated annual electricity savings: 1% to 19%
- Annual energy cost savings per house: $0 to $1,285



Detail of Dropped Ceiling approach

Assuming the practices in the *Builder's Guide* achieve a 0.1% market penetration in California the first year, increasing to 10% after 10 years, statewide benefits would be:

- First-year electricity savings: 266 MWh. Ten-year cumulative savings: 178,768 MWh.
- Ten-year net energy cost savings: $22.9 million.